

CLAIMS

We Claim:

1. An article comprising a plasticized polyolefin composition comprising one
5 or more polyolefins and one of more non-functionalized plasticizers where
the non-functionalized plasticizers have a kinematic viscosity ("KV") of 2
cSt or less at 100 °C.
2. The article of claim 1 wherein the non-functionalized plasticizer comprises
10 at least 50 weight%, of C₆ to C₁₀₀ isoparaffins.
3. The article of claim 1 wherein the non-functionalized plasticizer comprises
at least 50 weight% of C₅ to C₂₅ n-paraffins having less than 0.1 %
aromatics.
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4. The article of claim 1 wherein the non-functionalized plasticizer comprises
at least 50 weight% of a dearomatized aliphatic hydrocarbon comprising
a mixture of normal paraffins, isoparaffins and cycloparaffins.
- 20 5. The article of claim 1 wherein the non-functionalized plasticizer comprises
at least 50 weight% of a dearomatized aliphatic hydrocarbon comprising
a mixture of C₄ to C₂₅ normal paraffins, C₄ to C₂₅ isoparaffins and C₄ to
C₂₅ cycloparaffins.
- 25 6. An article comprising a plasticized polyolefin composition comprising one
or more polyolefins and one of more non-functionalized plasticizers where
the non-functionalized plasticizer comprises C₂₀ to C₁₅₀₀ paraffins having a
kinematic viscosity of 10 cSt or more at 100 °C and a viscosity index of
120 or more.
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7. An article comprising plasticized polyolefin composition comprising one
or more polyolefins and one of more non-functionalized plasticizers where

the non-functionalized plasticizer comprises oligomers of C₅ to C₁₄ olefins having a kinematic viscosity of 10 cSt or more at 100 °C and a viscosity index of 120 or more.

- 5 8. An article comprising plasticized polypropylene compositions comprising polypropylene and one or more non-functionalized plasticizers where the non-functionalized plasticizer comprises oligomers of C₆ to C₁₄ olefins having viscosity index of 120 or more, provided that when the plasticized composition comprises between 4 and 10 weight % of polyalphaolefin that is a hydrogenated, highly branched dimer of an alpha olefin having 8-12 carbon atoms, the composition does not comprises between 18 and 25 weight percent of a linear low density polyethylene having a density of 0.912 to 0.935 g/cc.
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- 15 9. An article comprising plasticized polypropylene compositions comprising polypropylene and one or more non-functionalized plasticizers where the non-functionalized plasticizer comprises oligomers of C₆ to C₁₄ olefins having viscosity index of 120 or more, provided that when the composition does not comprises an impact copolymer of polypropylene and 40-50 weight% of an ethylene propylene rubber or provided that the composition does not comprise a random copolymer of propylene and ethylene.
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10. An article comprising plasticized polyolefin composition comprising a polyolefin and a non-functionalized plasticizer where the plasticizer comprises a mineral oil having a saturates levels of 90% or more, sulfur contents of 0.03 % or less, and VI of 120 or more.
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11. An article comprising plasticized polyolefin composition comprising a polyolefin and a non-functionalized plasticizer where the plasticizer comprises a mixture of branched and normal paraffins having from 6 to 50 carbon atoms and a ratio of branch paraffin to n-paraffin ratio ranging from 0.5:1 to 9:1.
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12. The article of claim 11 where the mixture comprises greater than 50 wt% mono-methyl species.
- 5 13. The article of claim 11 where the plasticizer comprises a mixture of branched and normal paraffins having from 10 to 16 carbon atoms and a ratio of branch paraffin to n-paraffin ratio ranging from 1:1 to 4:1.
- 10 14. The article of claim 7 wherein the non-functionalized plasticizer comprises an oligomer of decene having a carbon number of 40-200.
- 15 15. An article comprising a plasticized polyolefin composition comprising one or more polyolefins and one or more non-functionalized plasticizers where the non-functionalized plasticizer comprises a linear or branched paraffinic hydrocarbon composition having a number average molecular weight of 500 to 20,000, having less than 10 % sidechains having 4 or more carbons, and having at least 1 or 2 carbon branches present at 15 weight % or more, and where the NFP comprises less than 2 weight % cyclic paraffins.
- 20 16. An article comprising a plasticized polyolefin composition comprising one or more polyolefins and one or more non-functionalized plasticizers where the non-functionalized plasticizer has an Mn of 15,000 and an Mw of 60,000 or less and comprises: 1) a copolymer of a C₄ raffinate; 2) a poly(n-butene); or 3) a copolymer of at least isobutylene derived units, 1-butene derived units, and 2-butene derived units.
- 25 17. The article of claim 1 wherein the where the article decreases less than 1 % in weight when stored at 70 °C for 312 hours in a dry oven.
- 30 18. The article of claim 1, 6 7, 10, 11, or 15 where the non-functionalized plasticizer comprises 0.1 weight % or less of functional groups selected from hydroxide, aryls and substituted aryls, halogens, alkoxys,

carboxylates, esters, carbon unsaturation, acrylates, oxygen, nitrogen, and carboxyl, based upon the weight of the NFP.

- 5 19. The article of claim 18 the non-functionalized plasticizer has a glass transition temperature (Tg) that cannot be determined or if it can be determined then the Tg is less than 30°C.
- 10 20. The article of claim 18 where the non-functionalized plasticizer has a distillation range having a difference between the upper temperature and the lower temperature of 20 °C or less.
21. The article of claim 18 where the non-functionalized plasticizer has an initial boiling point greater than 110 °C.
- 15 22. The article of claim 18 where the non-functionalized plasticizer has a pour point of -15 °C or less.
- 20 23. The article of claim 18 where the non-functionalized plasticizer has a specific gravity of less than 0.86.
24. The article of claim 18 where the non-functionalized plasticizer has a specific gravity from 0.70 to 0.86.
- 25 25. The article of claim 18 where the non-functionalized plasticizer has a final boiling point of from 115°C to 500°C.
26. The article of claim 18 where the non-functionalized plasticizer has a weight average molecular weight between 2,000 and 100 g/mol.
- 30 27. The article of claim 18 where the non-functionalized plasticizer has a flash point of -30 to 350°C.

28. The article of claim 18 where the non-functionalized plasticizer has a dielectric constant at 20°C of less than 3.0.
29. The article of claim 18 where the non-functionalized plasticizer has a
5 density of from 0.70 to 0.83 g/cm³.
30. The article of claim 18 where the non-functionalized plasticizer has a kinematic viscosity of from 0.5 to 20 cSt at 25°C.
- 10 31. The article of claim 18 where the non-functionalized plasticizer has a carbon number of from 6 to 150.
32. The article of claim 18 where the non-functionalized plasticizer has a carbon number of from 7 to 100.
- 15 33. The article of claim 18 where the non-functionalized plasticizer has a carbon number of from 10 to 30.
34. The article of claim 18 where the non-functionalized plasticizer has a
20 carbon number of from 12 to 25.
35. The article of claim 18 where the plasticized composition has a single glass transition temperature that is below that of the polyolefin itself.
- 25 36. The article of claim 18 where the T_g of the plasticized composition is at least 4 °C lower than that of the neat polyolefin.
37. The article of claim 18 where in that the T_g of the plasticized composition is at least 10 °C lower than that of the neat polyolefin.
- 30 38. The article of claim 18 where the T_g of the plasticized composition is at least 15 °C lower than that of the neat polyolefin.

39. The article of claim 18 where the peak melting temperature of the neat polyolefin is within 1 to 4°C of the plasticized polyolefin.
- 5 40. The article of claim 18 where the crystallization temperature of the neat polyolefin is within 1 to 4°C of the plasticized polyolefin.
41. The article of claim 1, 6, 7, 10, 11, 15 or 16 where the polyolefin comprises polypropylene or polybutene.
- 10 42. The article of claim 41 where the polyolefin comprises isotactic polypropylene.
43. The article of claim 41 where the polyolefin comprises syndiotactic polypropylene.
- 15 44. The article of claim 41 where the polyolefin comprises highly isotactic polypropylene.
- 20 45. The article of claim 41 where the polyolefin comprises a random copolymer of propylene and up to 5 weight % of ethylene.
46. The article of claim 41 where the polyolefin comprises an impact copolymer.
- 25 47. The article of claim 41 where the polyolefin further comprises an elastomer.
48. The article of claim 41 where the polyolefin further comprises a plastomer.
- 30 49. The article of claim 41 where the polyolefin has an Mw of 30,000 to 1,000,000 g/mol.

50. The article of claim 41 where the polyolefin has an Mw/Mn of 1.6 to 10.
51. The article of claim 41 where the polyolefin has a melting point (second
5 melt) of 30 to 185 °C.
52. The article of claim 41 where the polyolefin has a crystallinity of 5 to 80%.
- 10 53. The article of claim 41 where the polyolefin has a heat of fusion between 20 to 150 J/g.
54. The article of claim 41 where the polyolefin has a Gardner impact strength, tested on 0.125 inch disk at 23°C of 20 in-lb to 1000 in-lb.
- 15 55. The article of claim 41 where the polyolefin has a 1% secant flexural modulus of from 100 MPa to 2300 MPa
56. The article of claim 41 where the polyolefin has a melt flow rate from 0.3
20 to 500 dg/min.
57. The article of claim 41 where the polyolefin comprises a copolymer of propylene and from 0.5 to 30 weight % of one or more comonomers selected from the group consisting of ethylene, butene, pentene, hexene,
25 heptene, octene, nonene, decene, dodecene, 4-methyl-pentene-1, 3-methyl pentene-1, 5-ethyl-1-nonene, and 3,5,5-trimethyl-hexene-1.
58. The article of claim 41 wherein the polyolefin comprises propylene, from 0 to 5 weight % of a diene, and from 2 wt% to 25 wt% ethylene, based on
30 the total weight of the polymer and has a narrow compositional distribution; a melting point (Tm) of from 25°C to 120°C; a heat of fusion of from 50 J/g to 3 J/g; an Mw/Mn of from 1.5 to 5; and a melt index (MI)

of less than 20 dg/min.

59. The article of claim 41 where the polyolefin has a tacticity index of 4 to 12.
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60. The article of claim 41 where the polyolefin is present at 50 to 99.99 weight %, based upon the weight of the polyolefin and the non-functionalized plasticizer.
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61. The article of claim 41 where non-functionalized plasticizer is present at 0.5 to 35 weight %, based upon the weight of the polyolefin and the non-functionalized plasticizer.
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62. The article of claim 41 where non-functionalized plasticizer is present at 1 to 15 weight %, based upon the weight of the polyolefin and the non-functionalized plasticizer.
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63. The article of claim 41 wherein the polyolefin is a propylene impact copolymer or blend comprising from 40% to 95% by weight of a Component A and from 5% to 60% by weight of a Component B based on the total weight of copolymer; wherein Component A comprises propylene homopolymer or copolymer, the copolymer comprising 10% or less by weight ethylene, butene, hexene or octene comonomer; and wherein Component B comprises propylene copolymer, wherein the copolymer comprises from 5% to 70% by weight ethylene, butene, hexene and/or octene comonomer, and from 95% to 30% by weight propylene.
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64. The article of claim 63 wherein the refractive index of Component A and the refractive index of Component B are within 10 % of each other, and, optionally the refractive index of the non-functionalized plasticizer is within 20 % of Component A, Component B or both.
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65. The article of claim 41 wherein polyethylene having a weight average molecular weight of from 500 to 10,000 is substantially absent and or wherein phthalates, adipates, trimellitate esters, and polyesters are substantially absent.
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66. The article of claim 41 where the article is a molded article.
67. The article of claim 41 where the article is packaging material.
- 10 68. The article of claim 41 where the article is a package.
69. The article of claim 41 where the article is a film.
70. The article of claim 41 where the article is a sheet.
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71. The article of claim 41 where the article is extruded.
72. The article of claim 41 where the article is thermoformed.
- 20 73. The article of claim 41 where the article is blow molded.
74. The article of claim 41 where the article is injection molded.
75. The article of claim 41 where the article is selected from the group consisting of: cookware, storageware, toys, medical devices, sterilization containers, sheets, crates, containers, packaging, wire and cable jacketing, pipes, geomembranes, sporting equipment, chair mats, tubing, profiles, instrumentation sample holders, sample windows, outdoor furniture, playground equipment, automotive, boat and water craft components.
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76. The article of claim 41 where the article is selected from the group consisting of: bumpers, grills, trim parts, dashboards, instrument panels,
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exterior door and hood components, spoiler, wind screen, hub caps, mirror housing, body panel, and protective side molding.

- 5 77. An article comprising polyolefin selected from polypropylene and or polybutene and a non-functionalized plasticizer where the non-functionalized plasticizer comprises C_6 to C_{1500} paraffins having a kinematic viscosity of 5 cSt or more at 100 °C and a viscosity index of 120 or more.
- 10 78. The article of claim 77 wherein the non-functionalized plasticizer has a kinematic viscosity of 10 cSt or more at 100 °C.
79. The article of claim 77 wherein the non-functionalized plasticizer comprises comprises oligomers of C_5 to C_{14} olefins.
- 15 80. The article of claim 77 wherein the non-functionalized plasticizer has a pour point of -5°C or less.
81. The article of claim 77 wherein the non-functionalized plasticizer comprises oligomers of C_8 to C_{12} olefins.
- 20 82. The article of claim 77 wherein the non-functionalized plasticizer comprises oligomers of two or more different olefins.
- 25 83. The article of claim 77 wherein the non-functionalized plasticizer comprises oligomers of C_8 , C_{10} and C_{12} olefins.
84. The article of claim 77 wherein the non-functionalized plasticizer has an M_n of 500 to 10,000.
- 30 85. The article of claim 77 wherein the non-functionalized plasticizer comprises an oligomer of decene having a carbon number of 40-200.

86. The article of claim 77 wherein the non-functionalized plasticizer comprises a mineral oil having a saturates levels of 90% or more, and sulfur content of 0.03 % or less.
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87. The article of claim 77 wherein the non-functionalized plasticizer comprises a mineral oil having a saturates levels of 98% or more, and sulfur content of 0.01 % or less.
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88. The article of claim 77 wherein the non-functionalized plasticizer has a viscosity index of 130 or more.
89. The article of claim 77 wherein the non-functionalized plasticizer comprises a linear or branched paraffinic hydrocarbon composition having a number average molecular weight of 500 to 20,000, having less than 10 % sidechains having 4 or more carbons, and having at least 1 or 2 carbon branches present at 15 weight % or more, and where the NFP comprises less than 2 weight % cyclic paraffins.
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90. The article of claim 77 wherein the non-functionalized plasticizer is present at 0.01 to 60 weight%, based upon the weight of the polyolefin and the non-functionalized plasticizer.
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91. The article of claim 77 wherein the non-functionalized plasticizer is present at 3 to 50 weight%, based upon the weight of the polyolefin and the non-functionalized plasticizer.
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92. The article of claim 77 wherein the non-functionalized plasticizer is present at 5 to 20 weight%, based upon the weight of the polyolefin and the non-functionalized plasticizer.
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93. The article of claim 77 wherein the polyolefin comprises a random copolymer comprising propylene and at least one other alpha-olefin.
- 5 94. The article of claim 77 wherein the polyolefin comprises a random copolymer comprising propylene and at least one other alpha-olefin selected from the group consisting of ethylene, butene, hexene, and octene.
95. The article of claim 77 wherein the polyolefin comprises
10 homopolypropylene.
96. The article of claim 77 wherein the polyolefin comprises polypropylene having a weight average molecular weight of from 10,000 to 400,000 and a molecular weight distribution of from 1 to 9.
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97. The article of claim 77 wherein the polyolefin comprises polypropylene having a weight average molecular weight of from 40,000 to 300,000 and a molecular weight distribution of from 1 to 6.
- 20 98. The article of claim 77 wherein the polyolefin comprises polypropylene having a weight average molecular weight of from 50,000 to 200,000 and a molecular weight distribution of from 1 to 4.
99. The article of claim 77 wherein the non-functionalized plasticizer has an
25 M_n of 500 to 21,000.
100. The article of claim 77 wherein the non-functionalized plasticizer has a dielectric constant at 20 °C of less than 3.0.
- 30 101. The article of claim 77 wherein the non-functionalized plasticizer has a specific gravity of less than 0.920.

102. The article of claim 77 wherein wherein said article is a film.
103. The article of claim 77 wherein said article is packaging material.
- 5 104. The article of claim 77 where the article is a molded article.
105. The article of claim 77 where the article is a package.
106. The article of claim 77 where the article is a sheet.
- 10 107. The article of claim 77 where the article is extruded.
108. The article of claim 77 where the article is thermoformed.
- 15 109. The article of claim 41 where the article is blow molded.
110. The article of claim 77 where the article is injection molded.
- 20 111. The article of claim 77 where the article is selected from the group consisting of: cookware, storageware, toys, medical devices, sterilization containers, sheets, crates, containers, packaging, wire and cable jacketing, pipes, geomembranes, sporting equipment, chair mats, tubing, profiles, instrumentation sample holders, sample windows, outdoor furniture, playground equipment, automotive, boat and water craft components.
- 25 112. The article of claim 77 where the article is selected from the group consisting of: bumpers, grills, trim parts, dashboards, instrument panels, exterior door and hood components, spoiler, wind screen, hub caps, mirror housing, body panel, and protective side molding.
- 30 113. An article comprising polypropylene and a non-functionalized plasticizer where the non-functionalized plasticizer comprises oligomers of C₅ to C₁₄

olefins having a kinematic viscosity of 5 cSt or more at 100 °C and a viscosity index of 120 or more.

114. The article of claim 113 wherein wherein said article is a film.
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115. The article of claim 113 wherein said article is packaging material.
116. The article of claim 113 where the article is a molded article.
- 10 117. The article of claim 113 where the article is a package.
118. The article of claim 113 where the article is a sheet.
119. The article of claim 113 where the article is extruded.
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120. The article of claim 113 where the article is thermoformed.
121. The article of claim 113 where the article is blow molded.
- 20 122. The article of claim 113 where the article is injection molded.
123. The article of claim 113 where the article is selected from the group
consisting of: cookware, storageware, toys, medical devices, sterilization
containers, sheets, crates, containers, packaging, wire and cable jacketing,
25 pipes, geomembranes, sporting equipment, chair mats, tubing, profiles,
instrumentation sample holders, sample windows, outdoor furniture,
playground equipment, automotive, boat and water craft components.
124. The article of claim 113 where the article is selected from the group
30 consisting of: bumpers, grills, trim parts, dashboards, instrument panels,
exterior door and hood components, spoiler, wind screen, hub caps, mirror
housing, body panel, and protective side molding.

125. A method to make an article of manufacture comprising subjecting the composition of claim 1, 6, 7, 10, 11, 15 or 16 to one or more of: injection molding, compression molding, transfer molding, casting, extruding, thermoforming, blow molding, meltblowing, laminating, pultrusion, draw reduction, rotational molding, or a combination thereof.
126. A method to make an article of manufacture comprising subjecting the composition of claim 77 to one or more of: injection molding, compression molding, transfer molding, casting, extruding, thermoforming, blow molding, meltblowing, laminating, pultrusion, draw reduction, rotational molding, or a combination thereof.
127. A method to make an article of manufacture comprising subjecting the composition of claim 113 to one or more of: injection molding, compression molding, transfer molding, casting, extruding, thermoforming, blow molding, meltblowing, laminating, pultrusion, draw reduction, rotational molding, or a combination thereof.
128. The article of claim 113 where the article is a syringe and the NFP has a kinematic viscosity of 6 csSt or more at 100 °C and is present at 3 to 10 weight %.
129. The article of claim 77 wherein the polyolefin comprises polypropylene.